SNOW SAMPLING SURVEY
IN THE VICINITY OF
MINNOVA INC., SCHREIBER
1988

JUNE 1989

Environment Ontario
Jim Bradley
Minister

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Report prepared by:

H.N. Pfeiffer
Senior Environmental Technician

D.J. Racette
Environmental Scientist

H.D. Griffin
Chief, Air Quality Assessment

TECHNICAL SUPPORT SECTION
NORTHWESTERN REGION

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INTRODUCTION

Minnova Inc. has developed a base metal mine and concentrator complex near Winston Lake, 20 kilometres northwest of Schreiber, Ontario. Minnova is adjacent to the former Zenmac Metal Mines Limited. In February, 1987, a pre-operational snow sampling survey was conducted around Minnova. The study found that snow chemistry was typical of areas unaffected by environmental contamination[1].

The mine started operations in August, 1987, and the first concentrates were produced on January 17, 1988. To document the effects of these activities on local air quality, snow sampling was carried out in February, 1988.

METHODS

Single samples of snow were collected on February 15, 1988 from 10 sites near the ore concentrator (Figure 1) and from two control sites remote from the study area. Core samples of the complete snow profile were obtained following standard Ministry procedures[2]. Snow meltwater samples were submitted to the Ministry's Thunder Bay and Toronto laboratories for determination of arsenic, cadmium, copper, iron, lead, mercury, silver, zinc, solids (dissolved, suspended and total), conductivity and pH.

RESULTS AND DISCUSSION

Results from the 1988 survey are presented in Table 1, along with comparable data from 1987. Arsenic and mercury were both found at normal levels and are not included in the table. Compared with pre-operational results and control values, levels of most parameters were elevated in 1988 at one or more sites. There were 11 exceedences of provincial contaminant guidelines in 1988, compared with three in 1987. Zinc levels were significantly elevated near the concentrator building and exceeded guidelines at

sites 4, 6 and 7. Trace to light amounts of fine grey particulate matter were observed on the snow surface at site 6. Figure 2 illustrates deposition patterns of zinc in the area of the concentrator. Cadmium, copper and iron were moderately elevated and exceeded Ministry guidelines at sites closest to the concentrator (sites 4 and 6). Lead levels decreased from 1987 to 1988.

Total solids increased in 1988, with two guideline exceedences. Conductivity was slightly higher in 1988 than in 1987, but there was no significant difference in meltwater pH.

At sampling points off Minnova property (sites 7 and 8), contaminant guidelines were exceeded only for zinc at site 7.

Correlation matrices for the 1988 data are presented in Table 2. The strong positive relationship between most of the parameters suggests that they are associated with a common source. The strong negative relationship between these parameters and distance from the concentrator implicates the concentrator building as the principal source of contaminant fallout.

CONCLUSIONS

A snow sampling survey was carried out around the Minnova Inc. Winston Lake mine site in February, 1988. Levels of cadmium, copper, iron and zinc were moderately to significantly elevated at sites on company property, where several exceedences of provincial contaminant guidelines were recorded. There was only one exceedence (for zinc) off company property. Correlation results implicate the ore concentrator as the source of contaminant fallout.

RECOMMENDATION

While contaminant fallout off company property is not a serious concern at present, the company should practice best possible housekeeping in the handling of ore concentrates.

REFERENCES

1. Racette, D. J. and H. D. Griffin, 1987. Pre-operational snow sampling survey in the vicinity of Minnova Inc., Schreiber, Ontario, 1987. Ontario Ministry of the Environment.

2. Ontario Ministry of the Environment, 1983. Field investigations procedures manual. Phytotoxicology Section, Air Resources Branch.

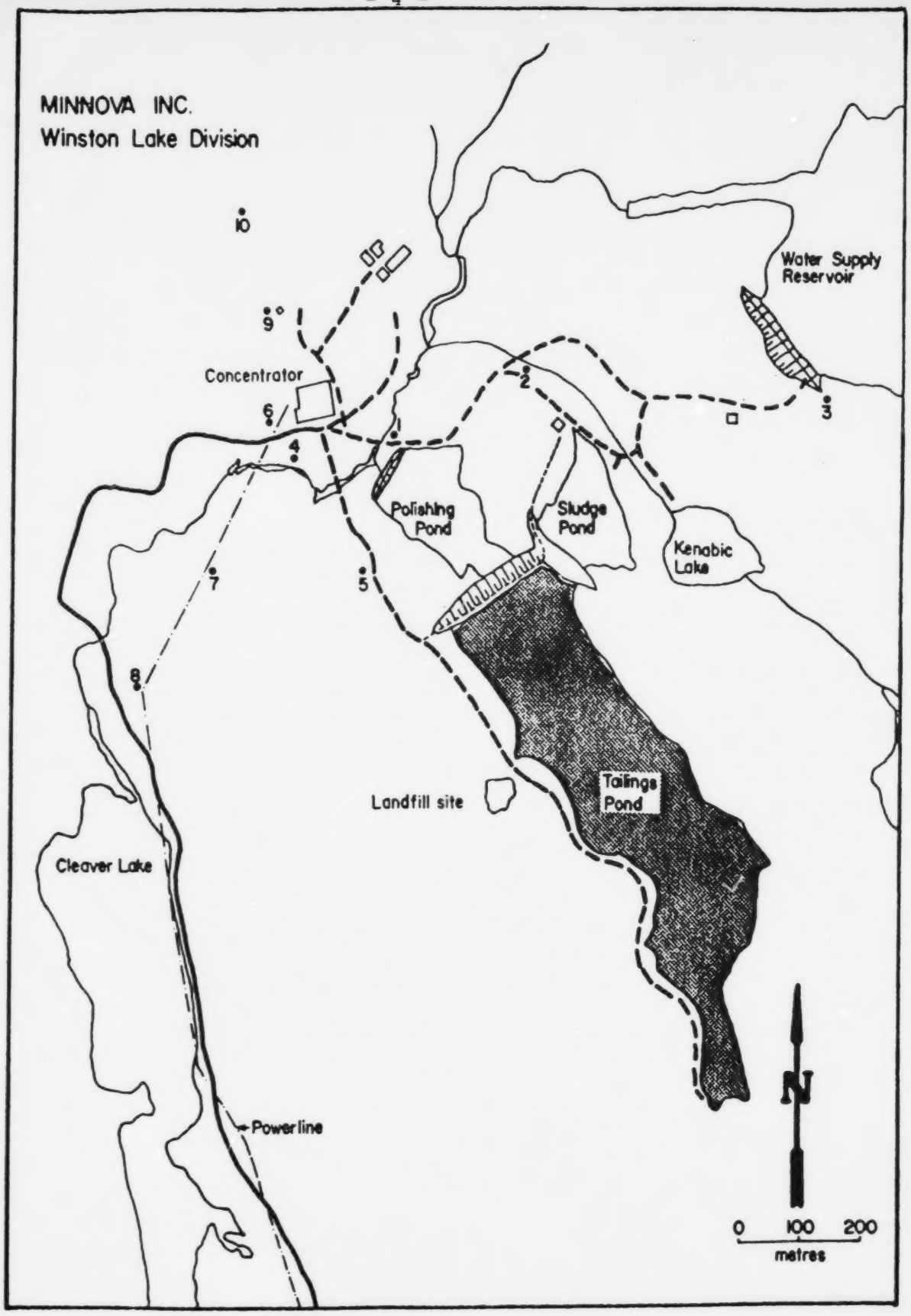

Figure 1. Snow sampling sites, Minnova Inc., February 5, 1988.

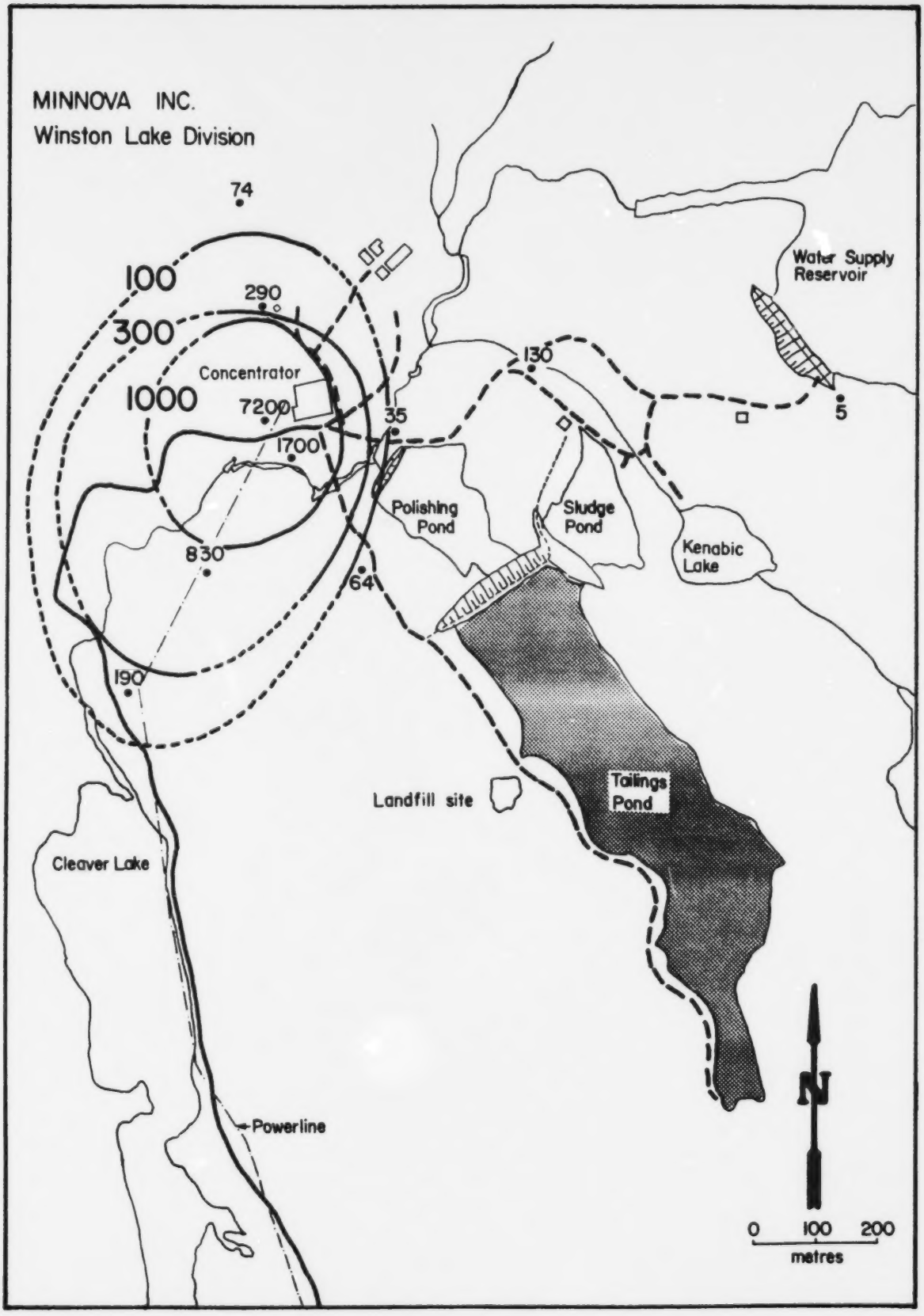

Figure 2. Levels of zinc (µg/l) in snow in the vicinity of Minnova Inc., February 15, 1988.

TABLE 1. Levels of cadmium, copper, iron, lead, silver, zinc (μg/l), solids (mg/l), conductivity (μmhos/cm) and pH in meltwater from snow collected in 1987 and 1988 near Minnova Inc., Schreiber, Ontario.

	Cd		Cu		Fe		Pb		Ag		Zn		Total solids		Cond.		pH	
Site	1987	1988	1987	1988	1987	1988	1987	1988	1987	1988	1987	1988	1987	1988	1987	1988	1987	1988
1	<0.5	<0.2	4	2	81	62	7	2	<0.2	0.5	13	35	4	25	10	18	4.7	4.5
2	<0.5	0.6	2	6	68	350	6	2	<0.2	0.5	4	130	4	50	9	25	5.0	4.8
3	<0.5	<0.2	2	<.5	120	36	5	2	<0.2	0.5	6	5	5	10	10	11	5.2	4.5
4	0.5	4.0[a]	89	75	420	1400	74	6	<0.2	0.5	340	1700	5	35	10	35	4.8	4.7
5	<0.5	<0.2	3	4	56	130	4	2	<0.2	0.5	9	64	3	20	12	16	4.6	4.4
6	<0.5	17.0	12	360	230	5900	12	8	<0.2	2.7	36	7200	10	120	11	16	4.8	5.6
7[b]	<0.5	2.0	5	32	66	610	6	2	<0.2	1.0	13	830	3	30	14	15	4.6	4.5
8[b]	<0.5	0.7	3	8	90	240	5	2	<0.2	0.8	7	190	5	30	16	16	4.6	4.4
9	<0.5	0.9	6	16	110	310	7	3	<0.2	0.7	22	290	5	25	11	50	4.7	4.5
10	<0.5	0.5	3	5	57	90	5	2	<0.2	0.6	4	74	5	20	11	13	4.6	4.5
Controls	<0.5	0.6	2	2	98	60	<3	<2	<0.2	0.8	4	18	8	15	15	20	4.8	4.4
Guidelines	3		60		700		70		–		300		40		60		–	

[a]Values exceeding contaminant guidelines have been underlined.
[b]Sites located off company property.

TABLE 2. Correlation matrix of selected parameters in snow meltwater, Minnova, February 15, 1988.

	As	Cd	Cu	Fe	Pb	Hg	Ag	Zn	Total Solids	Cond.	pH
Cd	.98*										
Cu	.98*	.99*									
Fe	.98*	.99*	.99*								
Pb	.96*	.90*	.90*	.91*							
Hg	.93*	.97*	.98*	.97*	.81*						
Ag	.91*	.97*	.98*	.97*	.79*	.99*					
Zn	.98*	.99*	.99*	.99*	.91*	.97*	.97*				
RST	.92*	.94*	.94*	.95*	.81*	.94*	.94*	.94*			
Cond.	.00	-.08	-.07	-.06	.21	-.16	-.16	.06	.04		
pH	.95*	.94*	.95*	.96*	.85*	.94*	.92*	.94*	.97*	-.03	
Dist.[1]	-.50	-.46	-.46	-.47	-.58	-.38	-.37	-.47	-.47	-.48	-.44

*Denotes a significant Pearson correlation for pairs of parameters at the 95% confidence interval.
Dist.[1] - distance from sampling sites to centre of concentrator building.

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